WHY DO FOREIGN-BORN BLACKS HAVE LOWER INFANT MORTALITY THAN NATIVE-BORN BLACKS? NEW DIRECTIONS IN AFRICAN-AMERICAN INFANT MORTALITY RESEARCH

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Objective: This study focuses attention on maternal nutrition and stress as possible reasons for excess black infant mortality after exploring lower infant mortality for the infants of foreign-born black mothers compared to native-born black mothers.

Methods: All births to non-Hispanic black women in New York City from 1988–1992 were examined and infant mortality for the infants of native-born women was compared to infant mortality for the infants of foreign-born women.

Results: Before controlling for potential confounders on the birth certificate, the infants of native-born black women had a greater risk of infant mortality than the infants of foreign-born black women: OR = 1.48 (95% confidence interval [CI] = 1.38, 1.58). After controlling for potential confounders, the infants of native-born black women still had a greater risk of infant mortality than the infants of foreign-born black women: OR_a = 1.32 (95% CI = 1.21, 1.43).

Conclusions: Maternal nutrition and stress are possible causes of excess black infant mortality. They should be topics for research and program development. (*J Natl Med Assoc.* 2002;94: 770–778.)

Key words: infant mortality ♦ birth place ♦ emigration and immigration ♦ blacks ♦ stress

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INTRODUCTION

There have been many attempts to describe and explain why black infant mortality is higher than white infant mortality ("excess black infant mortality"). The history of perinatal epidemiology is almost synonymous with the history of attempts to understand and decrease excess black infant mortality.

And yet public health has had strikingly little success in decreasing excess black infant mortality. Blacks, like whites, have benefited from improvements in neonatal intensive care, immunizations, folic acid fortification of grains,

and back-to-sleep campaigns. But the disparity between black and white infant mortality has not decreased.[1]

Explanations based on poverty have largely been supplanted by explanations based on preterm birth.[2–17] Researchers also have generally found that foreign-born women have better birth outcomes than native-born women.[18–32] Cabral and colleagues found that foreign-born black women in Boston had better pre-pregnancy nutrition, less use of tobacco, alcohol and drugs, and had fewer infants with low birthweight than native-born black women.[33]

New York City is an ideal laboratory in which to explore the impact of maternal nativity on black infant mortality because of the large number of both native-born and foreign-born non-Hispanic black women giving birth in the city.[18,34] We studied the foreign-born/native-born contrast to see what light it might shed on excess black infant mortality. (Since all the women described in this study are non-Hispanic blacks, the term "black" should be interpreted as "non-Hispanic black.")

METHODS

The sample for this study was drawn from all (non-Hispanic) black infants born in New York City (NYC) from 1988–1992 to NYC residents. Race and ethnicity on birth certificates are determined by a combination of maternal self-identifiction and designation by hospital staff. Race was taken from the mother's race on the birth certificate. Birth certificates indicate birthplace of the mother; women born outside the United States are foreign-born. The infant mortality rate (IMR) was the outcome of interest. We used infant mortality rate as our outcome because access to Level 3 neonatal intensive care units is high and relatively uniform throughout New York City. The New York City Department of Health (NYCDOH) routinely links all infant death certificates to their birth certificates. Data on births and neonatal deaths from 1988 to 1992 for each New York City hospital were obtained from the NYCDOH Office of Vital Statistics.

The cohort consisted of all live births from January 1, 1988, to December 31, 1992, and all known infant deaths (before first birthday) to those babies. All other infants were considered alive at one year and did not contribute to the numerator of the IMR. IMR was calculated by placing all known linked infant deaths in the numerator and all known live births in the denominator. This method undercounts infant mortality by excluding infant deaths that occurred outside New York City.

Data on risk factors for infant death were obtained from birth and death certificates. Available factors included any medical problems during the pregnancy; tobacco, alcohol, cocaine, heroin, methadone, and marijuana use during pregnancy; insurance coverage; infant gender; interval since previous pregnancy; age of mother; and number of days from the last menstrual period to the first prenatal visit. The mother's census tract of residence at the time of birth was linked with 1990 census data to provide mean household income by census tract. Interpregnancy interval was computed as the time from the termination of the most recent pregnancy to the infant's date of birth (for women with any previous pregnancies). Dummy variables were constructed for use during pregnancy of tobacco, alcohol, marijuana, cocaine, heroin, and methadone.

Data analysis proceeded in several steps. First, we compared the IMR across risk factors, stratified by native-born and foreign-born mothers. Chi-square tests were used to determine whether each risk factor was significantly associated with infant death. Second, a multivariate logistic regression model was constructed that predicted infant death by nativity of the mother, adjusted for other risk factors for infant death. The full model with all risk factors was reduced to the most parsimonious through a process of backward selection. Variables that did not meet the 0.05 confidence limit, and were not confounding other variables in the model, were removed. Parameter estimates for the logistic regression model represent an odds ratio (OR). For example, the

parameter estimate for nativity represents the odds of having an infant death among native-born compared to foreign-born mothers.

RESULTS

From 1988 through 1992 there were 204,176 live births to black women in New York City. Among these, the mother's nativity is unknown for 1202 of these live births. The analysis presented here is of the 202,974 babies whose maternal nativity is known.

Table 1 describes characteristics of the 202,974 live births in New York City in 1988 to 1992 to black women: 130,681 (64.4%) to native-born women and 72,293 (35.6%) to foreign-born women. Native-born women were 1.48 times as likely to have an infant death than foreign-born women (95% confidence interval [CI] = 1.38, 1.58).

Table 1 also indicates differences between the two groups of women. For example, the use of tobacco, cocaine and opiates was associated with increased IMR in both groups, but substance use was more prevalent among native-born women.

Table 2 shows that native-born women have a significantly greater risk of infant mortality, even after controlling for potential confounders: OR_a = 1.32 (95% CI = 1.21, 1.43). We found the following variables to be significantly confounding risk factors: maternal cocaine, methadone or cigarette use during pregnancy, any medical problems during the pregnancy, non-HMO insurance, first trimester initiation of prenatal care, infant gender, and maternal age.

A majority (64.0%) of foreign-born black women giving birth in New York City during the study period were born in the West Indies, the English-speaking nations of the Caribbean region,[35–36] including Jamaica (29.1%), Trinidad and Tobago (11.6%), and Guyana (10.3%). Among other nations where mothers were born, only Haiti (21.9%) was the birthplace of more than 3% of the women (data not shown).

DISCUSSION

We found that after adjusting for potential confounders, IMR was lower for infants of foreign-born black women than native-born black women (OR_a = 1.32). Our findings are similar to those of two other studies that compared IMR for foreign-born and native-born black women, although Kleinman provided only crude rates (RR = 1.40)[5] and Singh and Yu adjusted for different confounders (OR_a = 1.35).[37]

This work is limited by the accuracy of birth certificates. For example, birth certificates underestimate the use of alcohol and drugs during pregnancy. It is also limited by what is not collected on birth certificates. For example, we know where mothers were born, but we know nothing about their life experience, including when foreign-born women came to the United States.

One possible explanation for the lower infant mortality of babies of foreign-born women is a "healthy immigrant effect". Perhaps immigrants are sturdier and have fewer reproductive losses than US-born women.[38] Doucet found a perinatal healthy migrant effect in Canada, including Caribbean-born mothers.[25] Some factors that might cause good reproductive outcomes among immigrants include: childhood health, nutritional status, better living conditions, better health care, less stress, learning more positive pregnancy-related health behaviors[32] and assertiveness, hopefulness and ambition. But any healthy immigrant effect among the Caribbean women who have migrated to NYC in the past 20 years is likely to be small because of the high proportion of young women immigrating.

The use of birth certificate variables provided some information, but there are many confounders that are not measured on birth certificates, some of which are amenable to further exploration. We believe that two of these factors may influence the infant mortality difference between infants of foreign-born and native-born black women: maternal nutrition

Table 1. Description of Non-Hispanic Black Women's Babies Born in New York City, 1988-1992

	Native-born Mother					Foreign-born Mother				
Totals	**Total n**	**%**	**Deaths**	**IMR**	**p***	**Total n**	**%**	**Deaths**	**IMR**	**p***
Totals	130,681	100.0	2938	22.5		72,293	100.0	1109	15.3	
Medical Risk Present										
Yes	29348	22.5	971	33.1	0.001	15216	21.0	336	22.1	0.001
No	101333	77.5	1967	19.4		57077	79.0	773	13.5	
Tobacco use during pregnancy										
Yes	19110	14.6	612	32.0	0.001	1355	1.9	44	32.5	0.001
No	111571	85.4	2326	20.8		70938	98.1	1065	15.0	
Alcohol use during pregnancy										
Yes	4133	3.2	178	43.1	0.001	423	0.6	13	30.7	0.365
No	126548	96.8	2760	21.8		71870	99.4	1096	15.2	
Marijuana use during pregnancy										
Yes	2377	1.8	96	40.4	0.001	172	0.2	5	29.1	0.344
No	128304	98.2	2842	22.2		72121	99.8	1104	15.3	
Cocaine use during pregnancy										
Yes	7383	5.6	360	48.8	0.001	289	0.4	11	38.1	0.001
No	123298	94.4	2578	20.9		72004	99.6	1098	15.2	
Heroin use during pregnancy										
Yes	779	0.6	46	59.1	0.001	28	0.0	2	71.4	0.049
No	129902	99.4	2892	22.3		72265	100.0	1107	15.3	
Methadone use during pregnancy										
Yes	895	0.7	47	52.5	0.001	28	0.0	4	142.9	0.060
No	129786	99.3	2891	22.3		72265	100.0	1105	15.3	
Health insurance coverage										
Medicaid	78399	61.8	1793	22.9	0.001	33039	47.0	442	13.4	0.001
HMO	14496	11.4	207	14.3		7386	10.5	107	14.5	
Self insured	10164	8.0	380	37.4		8217	11.7	165	20.1	
Other	23848	18.8	423	17.7		21619	30.8	360	16.7	
Sex of baby										
Male	66584	51.0	1666	25.0	0.001	36632	50.7	626	17.1	0.011
Female	64097	49.0	1272	19.8		35661	49.3	483	13.5	
Interval between pregnancies										
< 274 days	10450	14.2	203	19.4	0.267	4356	10.7	52	11.9	0.733
≥274 days	63164	85.8	1236	19.6		36442	89.3	492	13.5	
Household annual income†										
<$18,651	62913	50.4	1465	23.3	0.771	11786	17.1	175	14.8	0.731
>$18,651	61990	49.6	1343	21.7		57297	82.9	891	15.6	
Age of Mother										
< 20	25227	19.7	465	18.4	0.146	4757	6.8	68	14.3	0.594
20–24	31115	24.3	653	21.0		10912	15.7	146	13.4	
25–29	36243	28.3	864	23.8		21495	30.9	311	14.5	
30–34	27682	21.6	695	25.1		23953	34.4	397	16.6	
35+	7783	6.1	198	25.4		8453	12.2	143	16.9	
Days to first prenatal visit										
<91 days	52636	47.0	801	15.2	0.001	32292	49.8	360	11.1	0.001
>91 days	59392	53.0	1143	19.2		32507	50.2	548	16.9	

IMR: deaths before one year per 1000 live births
*p-values compare variable within native-born or foreign-born stratum
†mean household income by census tract, 1990 Census

Table 2. Logistic Regression Model Predicting Infant Mortality Among Non-Hispanic Black Women's Babies Born in New York City, 1988-1992

Variable	OR	95% CI	p*
Nativity (ref: foreign born)	1.32	(1.21, 1.43)	0.0001
Methadone use (ref: no)	1.94	(1.42, 2.66)	0.0001
Cocaine use (ref: no)	1.84	(1.60, 2.13)	0.0001
Smoke cigarettes (ref: no)	1.21	(1.08, 1.35)	0.0008
Medical Risk present (ref: no)	1.63	(1.51, 1.76)	0.0001
First prenatal visit (ref: <91 days)	1.59	(1.47, 1.71)	0.0001
Gender of baby (ref: female)	1.25	(1.17, 1.35)	0.0001
Maternal age (per year)	0.99	(1.00, 1.01)	0.0058
Insurance (ref: HMO)			
Medicaid	1.23	(1.11, 1.39)	0.0003
3rd Party	1.06	(0.93, 1.20)	0.3458
Self (no insurance)	1.52	(1.52, 2.04)	0.0001

*p values are calculated from a Wald Chi-square test
CI: confidence interval

and stress. Because the largest number of foreign-born black women in this cohort were born in Jamaica and a majority were born in English-speaking Caribbean countries, our discussions of these factors will focus, where possible, on those nations.[36]

MATERNAL NUTRITION

There is little published research about the impact of pre-pregnancy nutrition on birth outcomes. From the Dutch famine we know that perinatal mortality can be increased in the offspring of women who were malnourished when they were fetuses.[39] From the siege of Leningrad we know that better prepregnancy nutrition decreases the impact of starvation on birthweight.[40] But no work has analyzed the effects of chronic childhood malnutrition or preadolescent diet on subsequent birth outcomes. And there is little published research on the impact of nutrient intake before pregnancy. Zhou and colleagues imply that low prepregnancy dietary iron is a risk factor for preterm labor.[41] There is a modest literature on the impact of maternal nutrients during pregnancy.[15,42-47]

The diets of immigrant women may deteriorate after immigration (because of cost, access or the desire to assimilate). For example, Guendelman and Abrams found that foreign-born Mexican women residing in the United States ate a better diet (more protein, vitamins A and C, and folic acid) than native-born Mexican American women 16 to 44 years old. Food choices deteriorated as income and assimilation increased.[48] This is also true for black women. As noted above, Cabral and colleagues found that foreign-born black women had better pre-pregnancy nutrition than native-born black women.[33] Perhaps related is Valanis' finding that foreign-born black women's years of NYC residence was inversely related to birthweight.[49]

Rumbaut and Weeks' study of 1464 pregnant women found that US-born women were more likely than foreign-born women to have diets that are lower in fruits, vegetables and cereals and higher in fats, oils and sweets. They found that US-born black women ate more fats, sweets and proteins than foreign-born black women.[29] Greenberg and colleagues found that Caribbean-born black women of all ages had diets that were healthier than the diets of native-born black women. The Caribbean-born women's diets were higher in vegetables, fruits, milk, pro-

tein and fats than the native-born women's diets.[50]

Lenders and colleagues found that adolescents consuming high-sugar diets had infants with lower birthweights than those consuming diets with less sugar.[51] High protein intake during pregnancy may also be characteristic of native-born diets. Several studies have found that high protein intake during pregnancy was associated with poorer birth outcomes.[29,52–53]

It seems possible that women who spent their childhood in Caribbean nations had childhood diets containing more fresh fruits and vegetables and less processed and junk foods. Improving the childhood and adolescent diet of native-born black girls might well improve their birth outcomes.

STRESS AND SOCIAL SUPPORT FOR PREGNANT AND POSTPARTUM WOMEN

Research on small mammals and pregnant women indicates that stress[54–65] and stressful life events[62,66–69] during pregnancy can precipitate preterm delivery and other adverse birth outcomes. Social support probably moderates the negative impact of stress on birth outcomes.[58,70–74]

Although immigration is certainly stressful, it is possible that lifelong exposure to racism is far more stressful for native-born black women than the stress of immigration dislocation.[75] There has been little research into the effects of childhood stress on subsequent birth outcomes.[39,57] Exposure to chronic stress may play a key role in explaining the high rate of poor pregnancy outcomes among native-born black women.

Hopefulness is an important characteristic of immigrants. Immigrants' hopefulness (for themselves and their families) may mediate the stress associated with poverty and dislocation. Many immigrants perceive poverty as the first stage to a better life; foreign-born women may be more hopeful than native-born women. Marshall notes that West Indian "women accepted ill-paying, low status jobs with an astonishing lack of visible resentment. For them, they were simply a means to an end: the end being the down payment on a brownstone house, a college education for their children, and the much coveted middle-class status these achievements represented. . . .The black immigrant is a fierce believer in and practitioner of the Protestant ethic. . . .[M]y mother and her friends perceived themselves as being more ambitious than black Americans, more hard working, and in terms of the racial question, more militant and unafraid in their dealings with white people."[76]

Social support of pregnant women may be especially important for women who live with significant stress. Rumbaut and Weeks found that immigrant women were more likely to be married and live in larger families than native-born women, and less likely than native-born women to live alone or to have stressful relationships with the father of the baby, her parents and her family.[29]

Social support in contemporary northern cities is lower for northern-born blacks than for migrants from the southern United States and foreign-born immigrants.[77] Edwards' study of black women found that mothers with stronger social support networks had less preterm delivery.[75] Norbeck and colleagues found that a tailored social support intervention caused decreased low birthweight (compared to women who had not received the intervention) among native-born black women with inadequate social support.[78]

Caribbean-born women come from a culture that is supportive of pregnant women. There is a tradition of "family lands" in the Caribbean. Small plots of land were held in common forever by all descendants of early freed slaves. The land was then available for members of the extended family to be assured a place to live, with an extensive support system potentially available.[79] Pregnant and postpartum women probably used this "family land" for social support and may seek family and communal support after immigration.

Valanis, studying NYC black families, found

that increased family size (as a proxy for increased social support) has a strong linear relationship with increased birthweight among foreign-born black women.[49] Compared to many other immigrant groups, Caribbeans have resisted assimilation and tried to recreate familiar cultural patterns and strong, ongoing ties with their homelands.[80] Many Caribbeans believe that if children spend their early childhood in the Caribbean homeland then there will be more people to care for them, they will learn about living within a community, and they will learn to cooperate with others.[81]

Thus, it is possible that relatively high levels of stress and low levels of social support contribute to excess native-born black infant mortality. Stress reduction and social support interventions should be tested for their impact on black birth outcomes.

FUTURE DIRECTIONS

This work suggests several directions for future research that might shed light on preventable causes of excess black infant mortality.

1. We know little about the effect of nutrition on pregnancy. Most work has been on the relation of pregnancy weight gain (not nutrients) with birth outcomes. Maternal diet deserves more attention than weight gain.[82] Future studies should explore the impact of diet and micronutrients on poor birth outcomes.[53]
2. Maternal use of tobacco, opiates and cocaine were among the risk factors most heavily associated with black infant mortality in the multivariate model. Native-born black women are already less likely to smoke than white women, but there is a need for increases in smoking cessation programs aimed at pregnant women. Drug use prevention programs exist, but there has been a shortage of drug treatment programs, especially for pregnant women.
3. Decreases in IMR may result more from activities that begin before conception than those that begin at the first prenatal care visit.[83] Strategies that alter health (including nutrition and stress) and service utilization before conception (perhaps even before puberty) may offer more hope of decreasing IMR than those that do not begin until conception or the initiation of prenatal care.[14]

CONCLUSIONS

Excess black infant mortality has not decreased despite intensive effort. Birth certificates are a useful but limited tool for exploring the causes of excess black infant mortality. Foreign-born black infant mortality is lower than native-born black infant mortality. This may be due to better maternal nutrition and less harmful stress in foreign-born than native-born black women. Improved nutrition, stress reduction and social support should be explored in research and programs to decrease native-born black infant mortality.

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